13. DOCUMENTATION

13.1 INTRODUCTION[1]

This section describes the various types of documents that should be generated with the Screening Walkdown and Evaluation Procedure and how they relate to each other. This section also describes the types of information which could be submitted to the DOE. The following five major types of documents are used with the DOE Seismic Evaluation Procedure:

- Seismic Equipment List (SEL)
- Screening Evaluation Work Sheets (SEWS)
- Outlier Seismic Evaluation Sheets (OSES)
- Screening Evaluation and Data Sheets (SEDS)
- Equipment Seismic Evaluation Report (ESER)

The Seismic Equipment List (SEL) and supporting documents should describe the overall approach used in identifying the equipment listed in the SEL and the basis for selecting the listed equipment. In addition, the SEL and its supporting documentation should describe the method used for verifying the compatibility of the SEL with the facility operating procedures. Further guidance for developing the SEL is provided in Chapter 4, which discusses the contents of and methods for generating the SEL.

The Screening Evaluation Work Sheets (SEWS), Outlier Seismic Evaluation Sheets (OSES), Screening Evaluation and Data Sheets (SEDS), and Equipment Seismic Evaluation Report (ESER) are discussed in Sections 13.2, 13.3, 13.4, and 13.5, respectively. Copies of the SEWS, OSES, and SEDS forms follow Section 13.5. The forms contained in the DOE Seismic Evaluation Procedure are suggested formats for documenting the information from the seismic evaluations. Other forms, which contain equivalent information to those discussed in this chapter, may be used to document the results of the seismic evaluations using this Procedure.

The extent of suggested documentation for the seismic evaluations is limited. The underlying reason is that the evaluations are to be done by highly-qualified individuals who have been trained in the use and application of the DOE Seismic Evaluation Procedure. For example, SCEs should have the background, experience, and training to make engineering judgments during the facility walkdown and thus avoid having to develop large quantities of backup documentation to record every decision made in applying the procedure. These SCEs are then held accountable for the scope, accuracy, and completeness of the Screening Evaluation and Walkdown process by signing that the results of the seismic evaluations are correct and accurate. One of these signatories should also be a licensed Professional Engineer, as discussed in Section 3.2.

13.2 SCREENING EVALUATION WORK SHEETS[2]

The purpose of the Screening Evaluation Work Sheets (SEWS) is to provide a convenient summary and checklist of the seismic evaluation criteria described in the DOE Seismic Evaluation Procedure. During the seismic walkdown, the SEWS can serve as a tool for collecting and organizing the important information from the seismic evaluation. The SEWS, or a similar checklist, should be used during the facility walkdown to document the results of the evaluation.

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[1] Based on Section 9.0 of SQUG GIP (Ref. 1)

[2] Based on Appendix G of SQUG GIP (Ref. 1)

Equipment class caveats and guidelines are summarized on the SEWS. Other informal documentation may be used by the SCEs as aids during the Screening Evaluation and Walkdown. These may include calculations, sketches, photographs, and charts. The SEWS should not be used unless the user has a thorough understanding of the DOE Seismic Evaluation Procedure and the reference documents.

There are 26 SEWS for most of the classes of equipment discussed in the DOE Seismic Evaluation Procedure. The 26 SEWS correspond to the following classes of equipment and sections from Chapters 8 through 10:

Batteries on Racks (Section 8.1.1)
Motor Control Centers (Section 8.1.2)
Low-Voltage Switchgear (Section 8.1.3)
Medium-Voltage Switchgear (Section 8.1.4)
Distribution Panels (Section 8.1.5)
Transformers (Section 8.1.6)
Battery Chargers and Inverters (Section 8.1.7)
Instrumentation and Control Panels (Section 8.1.8)
Instruments on Racks (Section 8.1.9)
Temperature Sensors (Section 8.1.10)
Fluid-Operated/Air-Operated Valves (Section 8.2.1)
Motor-Operated Valves (Section 8.2.2 MOV)
Solenoid-Operated Valves (Section 8.2.2 SOV)
Horizontal Pumps (Section 8.2.3)
Vertical Pumps (Section 8.2.4)
Chillers (Section 8.2.5)
Air Compressors (Section 8.2.6)
Motor-Generators (Section 8.2.7)
Engine-Generators (Section 8.2.8)
Air Handlers (Section 8.2.9)
Fans (Section 8.2.10)
Horizontal Tanks and Heat Exchangers (Section 9.1.2)
Cable and Conduit Raceway Systems (Section 9.2.1)
Piping (Section 10.1.1)
HVAC Ducts (Section 10.4.1)

SEWS are not provided for several classes of equipment. For these classes of equipment, the SEWS for Section 10.X.X can be used as a template and the checklists provided in the sections for those classes of equipment can be used during the facility walkdown. SEWS are not provided for the following classes of equipment and sections:

Vertical Tanks (Section 9.1.1)
Underground Piping (Section 10.1.2)
HEPA Filters (Section 10.2.1)
Glove Boxes (Section 10.2.2)
Miscellaneous Machinery (Section 10.2.3)
Underground Tanks (Section 10.3.1)
Canisters and Gas Cylinders (Section 10.3.2)
Unreinforced Masonry (URM) Walls (Section 10.5.1)
Raised Floors (Section 10.5.2)
Storage Racks (Section 10.5.3)
Relays (Chapter 11)

Most of the information at the top of each SEWS (equipment ID number, equipment description, equipment location, etc.) can be entered on the SEWS prior to the facility walkdown. If a data base program is used to develop the SEL, then the information at the top of each page of the SEWS can be printed directly from the data base file containing the SEL information.

The SEWS can be used as a checklist by circling the appropriate symbol in response to each statement. The meaning of the symbols is given below:

Y - Yes. This criterion is met. ("Y" is always the favorable response, i.e., all the "Y" symbols should be circled if an item of equipment is seismically adequate.)

N - No. This criterion is not met.

U - Unknown. It cannot be determined whether this criterion is met at this time. (This response can be used while the screening evaluation is in progress to identify criteria which must be evaluated later.)

N/A - Not Applicable. Some of the criteria may not apply for a particular item of equipment.

Some of the statements on the SEWS ask which of several alternatives is being used in the Screening Evaluation and Walkdown and the meaning of these symbols is self-explanatory. Likewise, when all the questions have a final response, the last question in each section of the SEWS can then be answered.

The SEWS also provide space to record information about the item of equipment, to document any comments the SCEs may wish to make, to document the reason why the intent of any caveats and guidelines are met without meeting the specific wording of the caveat rule, to sketch the equipment, and to sign off. In addition, the SEWS has a "Recommend Resolution" section to summarize the equipment evaluation. For equipment identified as an outlier, this section provides space to identify potential outlier resolution approaches. The resolution choices are:

- Maintenance action
- Further evaluation
- Retrofit design
- Other
- No further action required. Equipment is seismically adequate.

At the bottom of the SEWS are signature lines for all those performing the Seismic Evaluation and Walkdown. As discussed in Chapter 3, there should be at least two SCE signatories and one of the SCEs should be a licensed Professional Engineer. A signature on the SEWS indicates the SCE is in agreement with all the entries and conclusions entered on the sheet and all signatories should agree with all the entries and conclusions.

The SEWS are designed to be compatible with the Screening Evaluation Data Sheets (SEDS) discussed in Section 13.4 so that the summary information from the SEWS can be transferred directly to the SEDS. The responses to the final question in each section of the SEWS and the overall conclusion can be entered directly into the appropriate column in the SEDS discussed in Section 13.4.

13.3 OUTLIER SEISMIC EVALUATION SHEETS[3]

The Outlier Seismic Evaluation Sheets (OSES) are used to document the reason(s) for an item of equipment identified as an outlier during a screening evaluation to fail the screening guidelines. A separate OSES should be completed for each item of equipment classified as an outlier as discussed in Chapter 12.

An item of equipment listed in the SEL, as described in Chapter 4, should be identified as an outlier if it does not meet the screening guidelines covered in the other sections of this procedure. If an item of equipment is identified as an outlier during a screening evaluation in one of the sections of the DOE Seismic Evaluation Procedure, then the reason(s) for failing to satisfy the screening guidelines can be documented on an Outlier Seismic Evaluation Sheet (OSES). Other documentation, such as the Screening Evaluation Work Sheets (SEWS) discussed in Section 13.3, also have provisions for outliers. A separate OSES should be completed for each item of equipment classified as an outlier. The information to be included in each of the four sections of the OSES is described below.

Section 1 of the OSES describes the item of equipment identified as an outlier. This is the same information as found in the first seven columns of the SEDS which is discussed in Section 13.4. On the OSES, however, more space is provided to describe the equipment so that more details can be included to facilitate later resolution of this outlier issue without requiring repeated trips into the facility.

Section 2 of the OSES defines those conditions which cause that item of equipment to be classified as an outlier. This section should identify which of the conditions is the cause for the item of equipment becoming an outlier. More than one condition may be the cause for the outlier. In addition, the reason(s) for the equipment being an outlier should be described in more detail. For example, the SCEs could indicate at what frequencies the demand exceeded the capacity.

Section 3 of the OSES can be used to provide a proposed method for resolving the outlier issue, based on the experience and detailed evaluation of that item of equipment by the SCEs or the Lead Relay Reviewer. This is an optional part of the outlier identification process. This section also provides space for supplying any additional information which may be used to implement the proposed method of resolution. This may include information such as an estimate of the fundamental natural frequency of the equipment.

13.4 SCREENING EVALUATION AND DATA SHEETS[4]

The results of the Screening Evaluation and Walkdown, as described in Section 2.1.3, should be documented on walkdown checklists. These checklists include the Screening Evaluation Work Sheets (SEWS) discussed in Section 13.2 and the Screening Evaluation Data Sheets (SEDS). Preparation of the SEDS includes a review of generic and facility-specific seismic documentation and a facility walkdown of the equipment listed on the SEL. The completed SEDS constitute a tabulated summary for the formal documentation of the Screening Evaluation and Walkdown and reflect the final judgment of the SCEs. The SEDS offer a convenient way for tabulating the significant information from the SEWS for all the equipment listed on the SEL.

The SEDS is arranged in rows and columns and each row contains one item of equipment listed in the SEL. The columns contain information about the equipment and the results of the Screening Evaluation and Walkdown. Guidelines for completing each of the columns are provided below.

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[3] Based on Section 5.2 of SQUG GIP (Ref. 1)
[4] Based on Section 4.6 of SQUG GIP (Ref. 1)

At the bottom of the SEDS are two sets of suggested signature blocks to be signed by those performing the Seismic Evaluation and Walkdown. The first block should be signed by all the SCEs who performed the Screening Evaluation and Walkdown. There should be at least two signatories and one of which should be a licensed Professional Engineer. A signature indicates the SCE is in agreement with all the entries and conclusions entered on the SEDS. All signatories should agree with all the entries and conclusions.

The second block for signatures at the bottom of the SEDS is for use by a safety professional, systems engineer, or operations engineer who may provide critical information to the SCEs during their seismic evaluation of the equipment. Examples of such information include how a piece of equipment operates or whether a feature on the equipment is needed to accomplish its safety function. Information of this type is particularly important if an item of equipment is found during the walkdown which should be added to the SEL. It is left to the SCEs to determine whether this second block of signatures is needed. Only the signature of the safety professional, systems engineer, or operations engineer should be documented on the SEDS and details of the information supplied to the SCEs need not be included.

Note that the completed SEDS reflect the final judgment of the SCEs. Prior to arriving at this final judgment, there may have been several walkdowns, calculations, and other seismic evaluations which form the basis for determining whether the equipment meets the screening guidelines contained in the DOE Seismic Evaluation Procedure.

Compilation of the information on the SEDS can be done using a data base management system. This makes it possible to manipulate the order in which the equipment is listed on the sheets. It may be convenient to use SEDS by location in the facility. This may optimize the routing of the SCEs during the walkdowns so that backtracking is minimized and separate teams of SCEs can cover different parts of the facility. After the walkdown is complete, the data base management system can be used to sort the equipment on the SEDS into lists of outliers or other categories of equipment.

The contents of each of the 16 columns of the SEDS are described below.

Columns 1 through 6 contain information for identifying and locating the equipment on the SEL.

Column 1 contains the equipment class number.

Column 2 contains the facility identification or tag number for the equipment. This is normally an alpha-numeric designation by which an item of equipment is uniquely identified in the facility. This identifier will permit direct access and a cross-reference to the existing facility files or data system for the item of equipment.

Column 3 contains both a designation of the facility system to which the equipment belongs and a description of the equipment. If the system designation is placed at the beginning of this field, then the equipment list can be sorted by system with a data base management system.

Column 4 identifies the building in which the equipment is located.

Column 5 contains the floor elevation from which the item of equipment can be viewed by the SCEs.

Column 6 contains a designation of the location of the equipment within the building. An example of this is by building column line intersection, such as F-12. This indicates the intersection of column lines F and 12. Alternatively, the room designation can be given; e.g., diesel generator room (DG room).

Columns 7 through 10 are used to document the source of the seismic capacity and the source of the seismic demand.

Column 7 contains the elevation at which the equipment is mounted; i.e., the elevation at which the equipment receives its seismic input (demand). This elevation should be determined by the SCEs during the walkdown. Note that this elevation may not be the same as the floor elevation given in Column 5.

Column 8 identifies the source of the seismic capacity. The following codes may be used:

DOC	Component-Specific Seismic Qualification Documentation.
RS	Reference Spectrum (for comparison to in-structure response spectra).
GERS	Generic Equipment Ruggedness Spectra, GERS.

If the GERS are used, a number designation (XXX) should also be given to indicate which unique GERS is used. If seismic qualification documentation is used, reference to the documentation should be noted in Column 16.

Column 9 indicates the experience data factor, F_{ED}, for the equipment.

Column 10 indicates the method used to define the seismic demand. The following codes may be used:

SDS	Seismic Demand Spectrum
IDS	In-Cabinet Demand Spectrum

If an in-structure response spectrum is used, a number designation should also be given to indicate which unique spectrum is used.

Columns 11 through 14 are used to document the results of the evaluation of the equipment against the four seismic screening guidelines: comparison of seismic capacity to seismic demand, caveat and guidelines compliance, anchorage adequacy, and seismic interaction.

Column 11 indicates whether capacity of the equipment exceeds the demand imposed on it. The following codes may be used:

Y	Yes, capacity exceeds demand.
N	No, capacity does not exceed demand.
U	Unknown whether capacity exceeds demand.

Column 12 indicates whether the equipment is within the scope of the earthquake/testing equipment class and meets the intent of all the caveats and guidelines for the equipment class. The following codes may be used:

Y Yes, the equipment is in the equipment class, and the intent of all applicable caveats and guidelines is satisfied.

N No, the equipment is not in the equipment class, or the intent of all applicable caveats and guidelines is not satisfied.

U Unknown whether the equipment is in the equipment class or whether the intent of all applicable caveats is satisfied.

N/A The earthquake/test equipment class and the caveats and guidelines are not applicable to this item of equipment.

Column 13 indicates whether the equipment anchorage meets the anchorage screening guidelines. The following codes may be used:

Y Yes, anchorage capacities equal or exceed seismic demand, and anchorage is free of gross installation defects and has adequate stiffness.

N No, anchorage capacities do not equal or exceed the seismic demand, or anchorage is not free of gross installation defects, or anchorage does not have adequate stiffness.

U Unknown whether anchorage capacities equal or exceed seismic demand, or whether anchorage is free of gross installation defects or has adequate stiffness.

N/A Anchorage guidelines are not applicable to this equipment; e.g., valves are not evaluated for anchorage.

Column 14 indicates whether the equipment is free of adverse seismic interaction effects. The following codes may be used:

Y Yes, the equipment is free of interaction effects, or the interaction effects are acceptable and do not compromise the function of the equipment.

N No, the equipment is not free of adverse interaction effects.

U Unknown whether interaction effects will compromise the function of the equipment.

Columns 15 and 16 are used to document the overall result of the equipment evaluation and to record a note number for explaining anything unusual for an item of equipment.

Column 15 indicates whether, in the final judgment of the SCEs, the seismic adequacy of the equipment is verified. Note that this judgment may be based on one or more walkdowns, calculations, and other supporting data. The following codes are used:

Y Yes, seismic adequacy has been verified, i.e., code "Y", for all the applicable screening guidelines:

(1) seismic capacity is greater than demand,
(2) the equipment is in the earthquake/test equipment class and the intent of all the caveats and guidelines is met,
(3) equipment anchorage is adequate, and
(4) seismic interaction effects will not compromise the function of the item of equipment.

N No, seismic adequacy does not meet one or more of the seismic evaluation criteria. Equipment is identified as an outlier requiring further effort in accordance with Chapter 12.

Note that there is no "Unknown" category in Column 15 since this column represents the final judgment by the SCEs. At this point, the item of equipment should be either verified to be seismically adequate (Y) or found to be lacking in one or more areas (N) and should be evaluated as an outlier in accordance with Chapter 12.

Column 16 can be used for explanatory notes. A number can be entered in this field which corresponds to a list of notes which provide additional information on the seismic evaluation of equipment. For example, a note could indicate that a solenoid-operated valve is mounted on the yoke of an air-operated valve (AOV) and is evaluated as a component mounted within the "box" of this AOV. This column should also be used to identify when the intent of any caveat and guidelines is met, but the specific wording of the rule is not needed.

13.5 EQUIPMENT SEISMIC EVALUATION REPORT[5]

The Equipment Seismic Evaluation Report (ESER) should summarize the equipment seismic evaluations which result from applying the procedures in the DOE Seismic Evaluation Procedure. The following information should be documented in the ESER:

- Resumes of the SCEs in the SRT.
- Description of the seismic design basis of the facility, description of the seismic demand of the facility including the design basis earthquake (DBE), identification of the performance category and function of the facility, description of the site characteristics, and basis for establishing the degree of uncertainty in the natural frequency of the building structure if unbroadened response spectra are used with frequency shifting of response peaks.
- List of systems and components in the SEL.
- Screening Evaluation and Walkdown documentation including the SEWS, OSES and SEDS.
- Notes, photographs, drawings, calculations, assumptions, and judgments, as appropriate, used to justify the Screening Evaluation and Walkdown.

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[5] Based on Section 9.4 of SQUG GIP (Ref. 1)

- Results of the Screening Evaluation and Walkdown for equipment on the SEDS forms, including descriptions of any cases which specific caveats and guidelines are met by intent without meeting the specific wording of the caveat rule.

- Description of outliers on OSES and SEWS forms and explanations of the safety and operation implications of not resolving these outliers.

- Results of engineering evaluations, tests, calculations, equipment modifications, and equipment replacements as well as a proposed schedule to resolve outliers.

- Description of significant or programmatic deviations from the DOE Seismic Evaluation Procedure.